INFLUENCE OF STEAM EXPLOSION ON CRYSTALLINITY PROPERTIES OF PURE CELLULOSE FIBER

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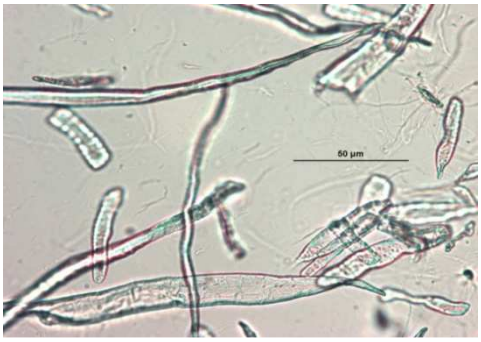
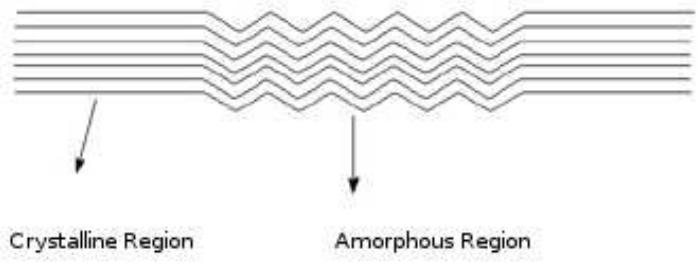
ABSTRACT

The aim of the present study is to compare the effect of different steam explosion treatments on crystallinity properties of a pure bleached cellulose. Steam explosion process is composed of two distinct stages: vapocracking and explosive decompression. The treatment intensities is determined by a severity factor, established by a correlation between temperature process and retention time. The results show that steam explosion treatment has an impact on the crystallinity properties of pure cellulose fiber. When the severity factor is below 5.2, an increase of the overall crystallinity of the samples is observed with the treatment intensities. For higher intensities, a significant thermal degradation of cellulose lead to an important change in substrate composition, which lead to a further decrease of cellulose crystallinity.

MATERIAL

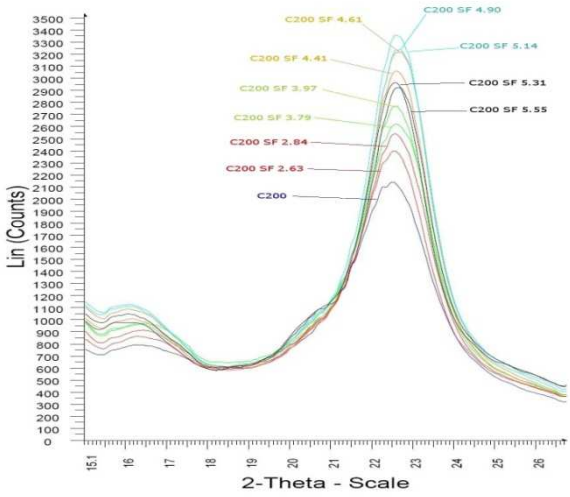


Microcrystalline cellulose fiber (Alba-fibre C-200) purified from components like hemicelluloses and lignin (<1%)

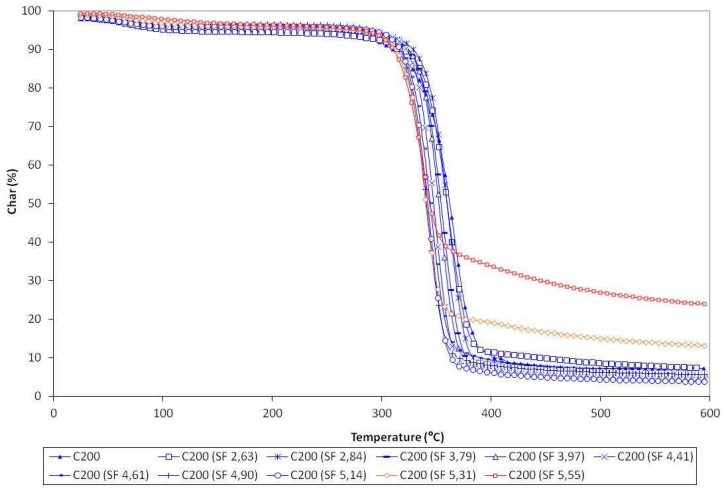


Cellulose microfibrils, showing crystalline and amorphous regions

RESULTS



X-ray diffraction pattern of cellulose C200 and cellulose C200 steam exploded samples



TGA evolution of steam exploded C200 with severity factor at 20°C/min

CONCLUSION

- Steam Explosion has an impact on cellulose crystallinity
- Overall crystallinity is increased when the severity factor is below 5.2
- There is an important thermal degradation and a decrease of crystallinity for severity factors higher than 5.2